

INJECTORS

FUNCTION

The injectors inject the amount of fuel required to operate the engine.

DESCRIPTION

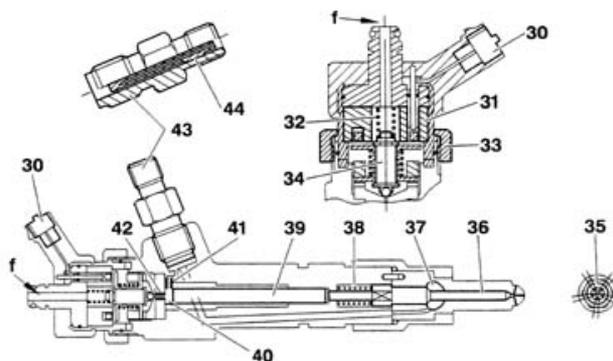
From a mechanical viewpoint, the injector does not differ essentially from the conventional injectors used in mechanical injection diesel engines.

The control solenoid is located in the upper part of the injector and secured to the injector case by nut (33).

The injectors incorporate 5 holes that improve the air/fuel mixture.

The amount of fuel injected depends on the following parameters:

- electrical command duration;
- injector opening speed;
- injector hydraulic output (hole number and diameter);
- fuel pressure in the fuel manifold (rail).



- f - fuel return to tank;
- 30 - electrical connector;
- 31 - electrical control solenoid;
- 32 - control solenoid spring;
- 33 - nut;
- 34 - control solenoid pintle;
- 35 - injector tip;
- 36 - injector pintle (5-hole nozzle);
- 37 - pressure chamber;
- 38 - injector spring;
- 39 - control piston;
- 40 - control chamber;
- 41 - supply nozzle;
- 42 - fuel return circuit nozzle;
- 43 - high pressure input connector;
- 44 - multilayer filter built into connector (43).

PRINCIPLE OF INJECTOR OPERATION

The fuel pressures used in the direct injection system obviate direct electrical control of the injectors. Injector opening is therefore achieved by exploiting the pressure difference between control chamber (40) and pressure chamber (37).

Injector pintle (36) is locked in its seat by spring (38) and surmounted by control piston (39) (the control piston is free to move in its bore).

The control piston head emerges into control chamber (40).

The control chamber is connected to the following circuits:

- fuel high pressure circuit via nozzle (41);
- return circuit to fuel tank via nozzle (42).

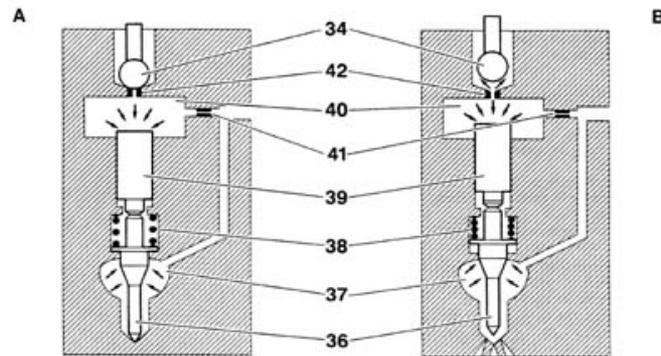
Control chamber (40) is insulated from the fuel return circuit by means of solenoid pintle (34).

Injector pintle (36) is locked in its seat by spring (32).

Fuel is distributed identically between chambers (40) and (37).

Nozzle (42) is bigger than nozzle (41).

 Maximum lift of control solenoid pintle: = 0.06 mm.



- With injector closed;
- B opening of one injector;
- 34 - control solenoid pintle;
- 36 - injector pintle;
- 37 - pressure chamber;
- 38 - injector spring;
- 39 - control piston;
- 40 - control chamber;
- 41 - feed nozzle;
- 42 - fuel return circuit nozzle.

A With injector closed.

The effort exercised by the high pressure is identical between control chamber (40) and pressure chamber (37). The control piston is immobile (locked against the injector pintle).

The pressure increase in the high fuel pressure common injection ramp promotes injector closure.

B opening of one injector.

The engine control unit supplies the control solenoid.

Operating stage from lifting of solenoid pintle (34) under the action of the control solenoid (magnetic field):

- fuel is lost via nozzle (42);
- fuel entering through nozzle (41) does not compensate for the loss through nozzle (42);
- the balance between the pressure in chambers (40) and (37) is lost;
- the pressure in pressure chamber (37) lifts the injector pintle;
- the control piston rises;
- fuel is sent to the piston head.

C Closure of an injector.

Operating stage from the time when the injection motor control unit cuts off power to the injector solenoid:

- the solenoid spring locks the solenoid pintle in its seat to block nozzle (42);
- fuel loss toward the return circuit is cut off;
- the pressure increase in control chamber (40) brings about injector closure;
- the balance of pressures between chambers (40) and (37) is re-established;
- the injector is ready for a new cycle.

ELECTRICAL PROPERTIES

The electrical supply to a solenoid is broken down into 2 stages.

a) Return stage.

The return stage brings about rapid lifting of the solenoid pintle. This is limited to a few tenths of a millisecond (0.3 ms).

The injector solenoid is supplied with:

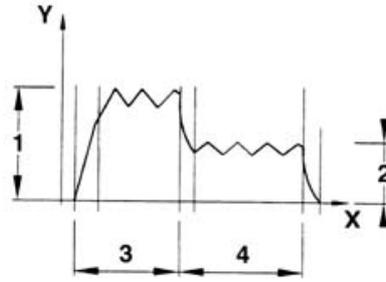
- a voltage of 80 Volts;
- a current of 20 A.

b) Maintenance stage.

The maintenance stage allows the solenoid power supply to be continued while limiting electrical power uptake.

The injector solenoid is supplied with:

- a voltage of 50 Volts;
- a current of 12 A.
- It is not possible to supply an injector with 12 Volts (solenoid would be destroyed).



- Y - current (A);
- X - duration (ms);
- 1 - return current;
- 2 - maintenance current;
- 3 - return stage;
- 4 - maintenance stage.